

JPL

GENESIS: GPS ENvironmental & Earth Science Information System

Jet Propulsion Laboratory
California Institute of Technology

WORKSHOP ON LEO MISSIONS
MARCH 9 - 13, 1999
POTSDAM, GERMANY

JPL

GENESIS: GPS Environmental & Earth Science Information System

GPS: The Global Positioning System

Partners: JPL (Project Leader: Tom Yunck)

USC/IMSC (Info Systems Lead)

Texas A&M (Science Co-Lead)

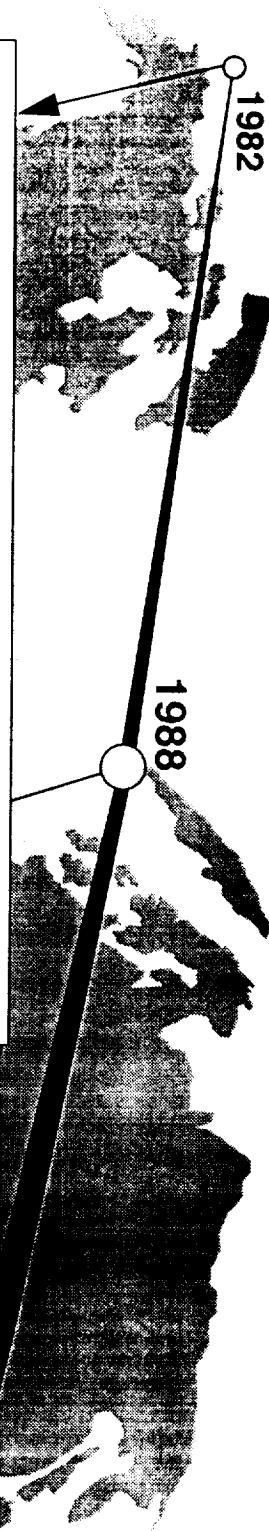
Goddard Inst. (Science Co-Lead)

University of Wisconsin

Columbia University



EARTH SYSTEM SCIENCE AT NASA



'Mission to Planet Earth' Inaugurated

- Study Earth as a complex interdependent system
- Understand and prepare for global change

Science Priorities

- Seasonal/Interannual climate prediction (El Nino)
- Causes of long-term (10-100 yr) climatic change
- Atmospheric chemistry (e.g., ozone)
- Terrestrial & marine ecosystems

First EOS Launches

1998

- Earth Observing System (**EOS**) Announced
- Coordinated fleet of small and medium Earth satellites
- Comprehensive Data Information System (**EOSDIS**)

PAST CONCEPTS FOR EOSDIS

1988

Raw Data

- Centralized Planning
- Massive Computing Facilities
- Billions of \$\$

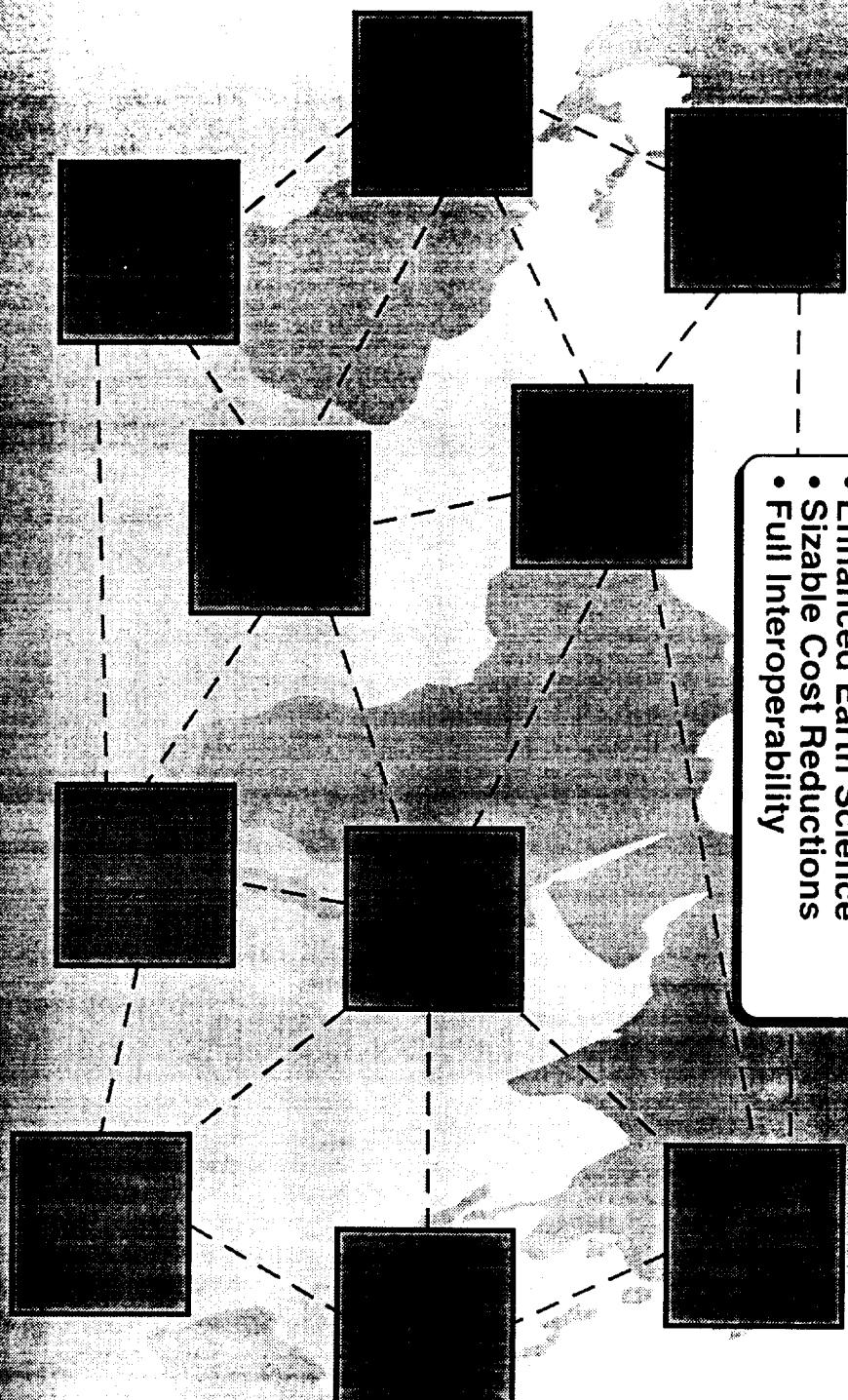
High Level Products

- Specialized Distributed Active Archives
- Located with Science Teams
- Rigid, Bureaucratic Central Management
- Costly Infrastructure

DAACS

1997: "Earth Science Information Partners" (or, "You figure it out")

- Self-Governing Federation
- Innovative Info Technologies
- Enhanced Earth Science
- Sizable Cost Reductions
- Full Interoperability



Objective of Genesis

- ◆ Data archiving, searching & distribution for science data products derived from:
 - Space-borne TurboRogue Space Receivers for GPS science
 - Other ground-based GPS receivers
- ◆ Data browsing using integrated visualization tools
- ◆ Interactive web/java-based data search & retrieval
- ◆ Data subscription service
- ◆ Data migration from existing GPS archived data
- ◆ On-line help and documentation
- ◆ Participation in the WP-ESIP Federation

GENESIS Products & Services

Focus on Atmospheric Occultation Products

- Profiles of refractivity, density, pressure, temp, moisture
- User-specified time and spatial averages of the above
- Global pressure contours, gradients, and derived winds
- Tropopause and boundary layer heights

Other User Services

- Versatile search and query across data centers
- Data subscription: automated notification & delivery
- Powerful data visualization tools: Vis-AD
- Downloadable science analysis tools
- Experimental "data mining" functions
- User-contributed products and tools
- Information: tutorials, papers, FAQs, helpline
- Online publishing

BASELINE TECHNOLOGY

- ◆ **Distributed Object Management (DOM) System**
 - JPL home grown & currently operational
 - File-based archive management system
 - API and Web-based interface for search engine
 - Data distribution via FTP
- ◆ **Others:**
 - Data visualization tools (University of Wisconsin-Madison)
 - Object-oriented database technology (USC)
 - Future research to provide:
 - ♦ time series analysis
 - ♦ feature extraction
 - ♦ discriminant analysis
 - ♦ pattern recognition

Other GENESIS Features

- Pilot derived from JPL's Distributed Object Manager
- Product system based initially on file management
- Search system based on high performance DBMS
- Will evolve into a true object-oriented system in 2 yrs
- Will draw from latest commercial & research systems:
 - INFORMIX™ Universal Server
 - Oracle-8
 - Paradise (U. Wisc.)
- Adopts Hierarchical Data Format (HDF)
- Web-based interface emphasizes Java applets
- Metadata is human-readable, machine parseable
 - Allows versatile subsetting and user-specified actions
 - Enforces intelligent demand control